SERT News

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A publication of the U.S. Coast Guard's Salvage Engineering Response Team (SERT)
http://www.uscg.mil/hq/msc/salvage.htm

SERT in Action:

Featuring major salvage activity from the previous Quarter

LADY GRACE:

Lead SERT member & POC: LT Jason Tama

The 75-foot trawler LADY GRACE ran aground at Rockaway Point, Long Island at 0300, May 10, 2001. SERT was contacted by the Casualty Action Center at Activities New York who requested technical assistance for the salvage evolution. We evaluated the force to free, as well as the vessel's strength and stability for the planned refloating evolution.

Due to the grounding, the vessel had sustained substantial damage, resulting in the flooding of the vessel's lazarette, fish hold and the main engine room. In addition, the vessel incurred damage to the interior bulkheads, rudder, propeller, and shaft.

By rapidly creating a computer model of the LADY GRACE from a similar hull form, we conducted a force-to-free and stability analysis. We also provided Activities New York with recommendations regarding what type of assets would be required to free the vessel and an assessment of the likely stability condition once the vessel was freed.

According to our calculations, the minimum force required to free the vessel at high tide could be generated by a tug with a shaft horsepower of approximately 3500-HP. In addition, we concluded that the vessel would not maintain adequate stability upon refloating if the progressive flooding within the engine room could not be controlled. We also recommended that the vessel's propeller be removed and shaft sealing reinforced to prevent flooding during the refloating operation.

After removal of the vessel's fuel and other pollution hazards, the contract salvor made three unsuccessful attempts to pull the vessel free at high tide. The first attempt was conducted with a 1400-HP tug, the second attempt was with a 2200-HP tug, and the third unsuccessful attempt utilized a 3800-HP tug. The LADY GRACE was finally freed from its grounded condition at 1830, May 21, 2001 using two tugs which totaled approximately 6000-HP. This attempt was made near the low-tide condition.

Despite the successful freeing of the vessel, she sank approximately one hour after being freed. It is our opinion that the vessel sank due to progressive flooding into the main engine room through the shaft seal.

Although the vessel sank after refloating, this case demonstrates the level of response and accuracy that can be achieved with superior communications between the MSC SERT and Marine Safety field offices. We encourage open communication with the field, as information gathering is one of the most important portions of the salvage response. We would like to give special thanks to LT Sean Brady at Activities New York for his cooperation in producing this article.

LADY GRACE aground at Rockaway Point, Long Island on May 10, 2001. SERT estimated a minimum of 7000-HP to free the vessel at low tide and 3500-HP at high tide.

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MISS GLORIA:

Lead SERT member & POC: LT Joe Dufresne

In April, 2001, MSO Morgan City requested the assistance of SERT as part of their casualty investigation into the capsizing of a 26-foot aluminum work boat. The MISS GLORIA was carrying a heavy load and eight workers through the bayous of Louisiana on October 26, 2000. After an evasive maneuver to avoid an oncoming boat, a small excavator and other items on deck shifted causing the MISS GLORIA to capsize. The casualty resulted in the death of a crew member.

We gathered information to assess whether the vessel was in an unsafe loading condition at the time of the casualty. Since no ship lines were available for the vessel, we used various CAD and hull fairing software to develop a computer model of the hull from section cut plans supplied by the manufacturer. Using this model, the vessel was analyzed under a series of capsizing phenomena such as high speed turns, load shifts, personnel crowding, and beam winds to determine its capacity to withstand these heeling moments as loaded at the time of the casualty.

Our technical analysis provided MSO Morgan City with a thorough assessment of dynamic vessel casualty scenarios for use in their ongoing investigation.

Education Corner:

FATIGUE RELATED CRACKS

Lead SERT member & POC: LT Matt Edwards

The Salvage Engineering Response Team (SERT) is often called for technical advice on fatigue related cracks, which are a common problem for older vessels. The primary concern usually pertains to crack propagation. A small crack can rapidly grow to a point where significant oil outflow or flooding can take place. This article is meant to provide field units with a background regarding crack growth and what actions we often recommend to prevent further damage.

All materials have micro-cracks that are present both on the surface and in the body of the material. These micro-cracks are not detectable by visual inspection. As part of normal operations, the hull material undergoes numerous stress cycles. These cyclic stresses cause the micro cracks to grow and join together forming larger detectable cracks. Cracks may also be initiated by ongoing processes such as corrosion, a one-time increase in stress levels due to cargo handling, or during structural fabrication processes such as welding or forming.

Cracks grow as a function of the tensile stress in the area surrounding the crack tip. The stress, in turn, varies with the shipboard environment such as payload distribution, weather, locked in residual stresses and the configuration of the hull material. The crack tip itself forms a discontinuity and the stress level at the tip is elevated as a result. As the crack length increases, the stress level needed to make it grow decreases. If left unattended, the crack will eventually reach such a length that it will grow uncontrollably under the influence of the prevailing stresses. The crack will continue to grow until either complete structural failure occurs or the crack is stopped due to a change in structural configuration such as the presence of a ship's frame or a stiffener.

One way to reduce the stress level at the crack tip is to drill a hole at the tip. This removes the notch effect due to the presence of the crack tip. Another method of decreasing stresses is to increase the amount of material by adding additional structure. However, these methods will not be effective if the stress level near the crack is very high.

Since cracks grow in the direction perpendicular to the prevailing tensile stress, different actions are required to reduce the stresses depending on the orientation of the crack. Cracks oriented perpendicular to the length of the ship (transverse cracks), are usually sensitive to the global stress field caused by the weight distribution. By redistributing the weight, the area around the crack can be placed in compression to retard crack growth. The vessel should also avoid heavy seas that could cause the stress field in the area of the crack to fluctuate between a hog and sag condition, thereby inducing tensile stresses where there were compressive stresses in the still water condition.

Longitudinal cracks are more sensitive to local stresses. One common method of reducing the tensile stress at the crack is to reduce the pressure difference between the two sides of the hull plating. For example, if there is a longitudinal crack in the hull plating in way of a ballast tank, the level of water in the ballast tank should be the same height as the water level outside. If the fluid is higher on either the interior or exterior of the ship, a pressure differential will form and create an area of higher stress. Furthermore, sea states with large swells should be avoided. As a wave passes along the hull, it will increase the pressure difference between the inside and outside of the hull. When the wave's trough is near the crack, there will be a relatively higher level of water in the ballast tank and therefore a higher pressure difference. Likewise, when the wave's crest is near the crack, the level of water on exterior of the hull will be higher than the level of water in the ballast tank creating an increase in pressure. As the pressure and stress around the crack fluctuates, the crack may continue to

grow.

The above methods are general guidelines we use to mitigate crack growth. However, some situations may require a more in-depth analysis. Should you be concerned with the presence of cracks on board a vessel, please feel free to contact us for assistance on how to best prevent further crack growth.

Message from the Team Leader:

Welcome to our second issue of the *SERT News*. We've tried to make this issue even better than the first. While in production, we found ourselves discussing the newsletter's purpose. In the end, it boiled down to a twofold focus: education and awareness.

First, we hope to educate our readers about salvage engineering. In this issue, we opened our *Education Corner* where LT Matt Edwards and Mr. Jack Kalro have prepared an article on fractures, which I expect will be informative to many of our readers. We've also listed upcoming salvage events and some recommended reading for those interested in salvage engineering.

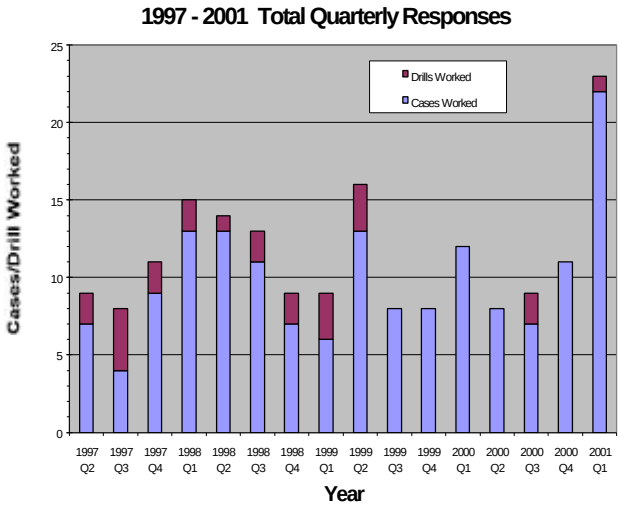
We also hope to make our readers aware of SERT's capabilities and services. One of the best ways to do this is by describing some of our cases. In this issue, you'll find a couple of cases in *SERT in Action* that highlight our capabilities. The first (LADY GRACE) demonstrates the accuracy of our recommendations for refloating a beached vessel. The second (MISS GLORIA) illustrates how salvage engineering can be used in a forensic nature for post-casualty analysis.

We hope you find these newsletters valuable and welcome your comments. Our next issue will be out sometime in October. Meantime, keep the calls coming. We stand ready to provide technical salvage engineering support during vessel emergencies, casualty investigations, and even during drills and exercises.

LCDR Paul Szwed
Salvage Engineering ResponseTeam Leader

Quarterly Responses:

The chart below will give readers an idea of how often the SERT is called to respond to salvage cases and casualty analysis.



Future Salvage Events & Suggested Reading:

Seattle Maritime Salvage Conference 2002. This conference is scheduled for January 16 and January 17, 2002. The conference provides seminars on salvage law, commercial contracting, insurance, public law & authorities, perspectives of UCS, and resources.

ITS 2002 - The 17th International Tug & Salvage Convention, to be held at the Euskalduna Conference Centre, Bilbao, NW Spain from 13-17 May 2002. The Convention is now in its 34th year and hosts 300+ delegates from 45 countries, along with approximately 50 exhibiting companies.

Modern Marine Salvage by William Milwee is published by the Society of Naval Architects and Marine Engineers. This text provides an excellent introduction to salvage engineering calculations, ship stability and structures, and many salvage engineering evolutions. This text is recommended for the first time salvor.

Testimonials & Feedback from the field:

- "...that was perfect, what you sent us." -*MSO Philadelphia*, while discussing the SERT review of the salvage plan for righting of the capsized barge loaded with a section of the Rancocas Bridge.

"…Resolve has interfaced with the SERT on several salvage operations during the past few years. During each of these operations, SERT personnel were very helpful and supportive throughout the operation. We believe that the SERT serves as a valuable technical resource to both the FOSC and the commercial salvage industry…" -*RESOLVE MARINE GROUP*

What is SERT?

Our Mission:

"*We provide engineering support to Coast Guard units during responses to vessel emergencies and investigations of vessel casualties.*"

The Coast Guard Salvage Engineering Response Team (SERT) is comprised of Marine Safety Center staff naval architects and engineers. SERT duty officers are on call **24 hours a day, 7 days a week**, to assist and support Coast Guard Captains of the Port (COTPs) in casualty situations such as groundings, collisions, explosions, fires and other emergent situations that pose potential risk to life and marine environment. SERT is also available to provide technical assistance with marine casualty investigations, to help prepare scenarios for and to participate in PREP Drills.

How to contact SERT?

The SERT may be contacted as follows:

- FLAGPLOT (manned 24 hours/7 days a week): (202) 267-2100 or 1-800-DAD-SAFE
- Salvage Team Leader: (202) 366-6441 or pager (866) 263-4918
- Salvage Team Duty Engineer: pager (866) 263-4919
- Marine Safety Center (0700 to 1630 daily): (202) 366-6480 or 6441

SERT email address: salvage@msc.uscg.mil

When contacting the SERT Duty member, it is helpful to have the Casualty Information Sheet filled out as completed as possible. This form can be found via the Internet at: http://www.uscg.mil/hq/msc/sertinfo.htm